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Mathematical model of the interconversion of amino acids in enterocyte: case of the arginine, citrulline and glutamine triplet

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Intestine could play an essential role in the adaptability of metabolism towards proteins supply fluctuations. Indeed, it controls the portal flow of arginine, potent inductor of amino acids hepatic oxidation, as well as the arginine conversion into citrulline. Citrulline is not taken up by the liver but is converted to arginine in kidney. *De facto*, the intestinal regulation of arginine flow is associated to the control of

arginine peripheral availability. In the same way, citrulline may also be produced from glutamine by enterocytes to maintain the arginine plasmatic concentrations.

We have developed a mathematical model based on the metabolic pathways involved in citrulline synthesis from glutamine and arginine in enterocyte. Considering the difficulties to obtain reliable and useable data, we have used and compared two different approaches. A first model built on first order kinetic equations and its associated differential equation, based on flow rate measures. This model does reproduce published amino acids triplet flux data. However, it does not take into account the enzyme saturation which occurs at high substrate concentration. For this reason we are developing a more complex model based on michaelian kinetics and their associated kinetic parameters, more adapted to saturation phenomena. These models allow a better understanding of the principal steps controlling the interconversion on this amino acids triplet.